

**HIGHWAY LIGHTING ACCIDENT WARRANT ANALYSIS  
WORKSHEET**

Location: \_\_\_\_\_

City/County: \_\_\_\_\_ / \_\_\_\_\_

Analysis Made By: \_\_\_\_\_ Date: \_\_\_\_\_

1. Determination of Need for an Accident Analysis

This analysis section must be completed for each individual intersection, interchange or one kilometer or less of a continuous section of roadway excluding any intersections or interchanges. Do not combine intersections, interchanges and/or continuous sections of roadway.

a. Accident Study Years:	_____	_____	_____	TOTAL			
b. Number of months studied in each year:	_____	+	_____	+	_____	=	_____
c. Number of Nighttime Accidents:	_____	+	_____	+	_____	=	_____
d. Number of Daytime Accidents:	_____	+	_____	+	_____	=	_____
e. Total Number of Accidents: (Add lines 1c & 1d.)	_____	+	_____	+	_____	=	_____
f. Night to Day Ratio: (Divide Line 1c by 1d.)	_____	+	_____	+	_____	=	_____
g. Number of Years Studied: (Divided Line 1b total by 12.)	_____	/	12	=	_____		
h. Average Number of Nighttime Accidents Per Year: (Divide Line 1c total by Line 1g.)	_____	/	_____	=	_____		
i. Average Number of Daytime Accidents Per Year: (Divide Line 1d total by Line 1g.)	_____	/	_____	=	_____		
j. Average Night to Day Ratio: (Divide Line 1h by Line 1i.)	_____	/	_____	=	_____		

**HIGHWAY LIGHTING ACCIDENT WARRANT ANALYSIS WORKSHEET**

**Figure 78-2B**

2. Type of light standards to be used: (Check One)

\_\_\_\_\_ Conventional Unit Only  
\_\_\_\_\_ Combination Tower and Conventional Units

3. Type of Lighting System: (Check One)

\_\_\_\_\_ Intersection  
\_\_\_\_\_ Partial Interchange  
\_\_\_\_\_ Full Interchange

4. Installation Costs: (Use Appendix A for Construction Costs)

a. Construction Cost: \_\_\_\_\_

b. Mobilization-Demobilization and Maintenance of Traffic Costs:  
(Multiply Line 4a by 7%) \_\_\_\_\_ x 0.07 = \_\_\_\_\_

c. Design & Construction Administration Costs:  
(Multiply Line 4a by 10%) \_\_\_\_\_ x 0.10 = \_\_\_\_\_

d. Total Installation Costs:  
(Add Lines 4a, 4b and 4c)..... =

5. Annual Operating and Maintenance Cost: (Use Appendix B for O and M Costs)

a. Operation and Maintenance Costs: \_\_\_\_\_

b. Administration Costs:  
(Multiply Line 5a by 10%) \_\_\_\_\_ x 0.10 = \_\_\_\_\_

c. Operating and Maintenance Cost Per Year:  
(Add Lines 5a and 5b)..... =

d. Total Operating and Maintenance Cost = Present worth of costs over the 20-year service life.

= Yearly Cost (Line 5c) x Present Worth Factor

= \_\_\_\_\_ x 13.5903 = \_\_\_\_\_

## HIGHWAY LIGHTING ACCIDENT WARRANT ANALYSIS WORKSHEET

**Figure 78-2B** (cont'd.)

e. Total Cost = Installation Cost + Total Operating and Maintenance Cost

= Line 4d + Line 5d = \_\_\_\_\_

6. Annual Safety Benefits: (Use Appendix C for Accident Costs)

a. Accident Study Years (Same as Section 1)	_____	_____	_____	TOTAL
b. Number of Months Studied (Same as Section 1)	_____	+	_____	+
c. Number of Vehicles Involved (Night Only)	_____	+	_____	+
d. Number of Injuries (Night Only)	_____	+	_____	+
e. Number of Deaths (Night Only)	_____	+	_____	+
f. Number of Years Studied: (Divided Line 6b total by 12.)	_____	/	12	=
g. Average Number of Nighttime Vehicles Involved Per Year: (Divide Line 6c total by Line 6f.)	_____	/	_____	=
h. Average Number of Nighttime Injuries Per Year: (Divide Line 6d total by Line 6f.)	_____	/	_____	=
i. Average Number of Nighttime Deaths Per Year: (Divide Line 6e by Line 6f.)	_____	/	_____	=
j. Accident Reduction Factor (from Appendix D):	= _____			
k. Reduction in Accident Costs Per Average Year due to Highway Lighting Being Installed:				
<u>Type of Damage: (No/Yr.)</u>	<u>Unit Cost</u> (Appendix C)	<u>Reduction</u> <u>Factor</u>	<u>Dollars</u> <u>Saved/Yr.</u>	
Vehicle _____ (Line 6g)	x _____	x _____	= _____	
Injuries _____ (Line 6h)	x _____	x _____	= _____	
Deaths _____ (Line 6i)	x _____	x _____	= _____	
Total Yearly Benefit: (Add all three lines)..... _____				

**HIGHWAY LIGHTING ACCIDENT WARRANT ANALYSIS WORKSHEET**

**Figure 78-2B** (cont'd.)

l. Assumptions: Service Life = 20 Years  
Interest Rate = 4%  
Inflation Rate = 0%  
Net Salvage Value = \$0

m. Traffic Growth Factor = \_\_\_\_\_ (from Appendix "E").

n. Total Benefits:

B = Present worth of the benefits over the 20-year service life = Yearly Benefit (Line 6k) x Present Worth Factor x Traffic Growth Factor (line 6m) =

\_\_\_\_\_ x 13.5903 x  
= \_\_\_\_\_

7. Benefit/Cost Ratio:

B/C = \_\_\_\_\_ (Line 6n) / \_\_\_\_\_ (Line 5e)

## APPENDIX A

### INSTALLATION COSTS (1994 COSTS)

#### Full Interchange Lighting

1)	Diamond -	Conventional	\$	324,000.
		Tower & Conventional		280,000.
2)	Cloverleaf -	Conventional	\$	416,000.
		Tower & Conventional		350,000.
3)	Partial Cloverleaf -	Conventional	\$	208,000.
		Tower & Conventional		175,000.

#### Partial Interchange Lighting (Conventional Units Only)

1)	Diamond -	\$	50,000.
2)	Cloverleaf -		104,000.

### **HIGHWAY LIGHTING ACCIDENT WARRANT ANALYSIS WORKSHEET**

**Figure 78-2B** (cont'd.)

3)	Partial Cloverleaf -		50,000.
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Continuous and Intersection Lighting

1)	Continuous (per kilometer)	- 4 Lane	\$ 95,000.
		- 2 Lane	47,000.
2)	4-Way Intersections	- 4 Lane	\$ 40,000.
		- 2 Lane	25,000.
3)	T-Intersections		\$ 20,000.

**APPENDIX B**

OPERATION AND MAINTENANCE COSTS (Per Year) (1994 COSTS)

Full Interchange Lighting

1)	Diamond -	Conventional	\$ 25,700.
		Tower & Conventional	19,300.
2)	Directional -	Conventional	\$ 52,700.
		Tower & Conventional	37,800.
3)	Cloverleaf -	Conventional	\$ 51,200.
		Tower & Conventional	37,400.
4)	Partial Cloverleaf -	Conventional	\$ 31,300.
		Tower & Conventional	19,500.

Partial Interchange Lighting

1)	Diamond -	\$ 12,100.
2)	Directional -	30,800.
3)	Cloverleaf -	35,300.
4)	Partial Cloverleaf -	8,800.

**HIGHWAY LIGHTING ACCIDENT WARRANT ANALYSIS WORKSHEET**

**Figure 78-2B** (cont'd.)

Continuous and Intersection Lighting

1)	Continuous (per kilometer)	- 4 Lane	\$	12,700.
		- 2 Lane		5,800.
2)	4-Way Intersections	- 4 Lane/4 Lane	\$	5,600.
		- 4 Lane/2 Lane		4,200.
3)	T-Intersections	- 4 Lane/4 Lane	\$	3,300.
		- 4 Lane/2 Lane		2,700.
		- 2 Lane/2 Lane		2,300.

**APPENDIX C**

COST OF MOTOR VEHICLE ACCIDENTS (1994 COSTS)

Cost Per Vehicle Involved	\$	1,400.
Cost Per Injured Person		11,000.
Cost Per Each Death		450,000.

**APPENDIX D**

ACCIDENT REDUCTION FACTORS

<u>Improvement</u>	<u>Factor</u>
Install New Lighting at Intersection/Interchange	0.37
Modernize Lighting at Intersection/Interchange	0.25
Install New Lighting at Bridge	0.59
Install New Lighting at Underpass	0.10

**HIGHWAY LIGHTING ACCIDENT WARRANT ANALYSIS WORKSHEET**

**Figure 78-2B** (cont'd.)

## **APPENDIX E**

### **TRAFFIC GROWTH FACTOR**

(Assuming 4% Interest Rate, 20-Year Service Life)

<u>Traffic Growth Rate</u>	<u>Traffic Growth Factor</u>
1%	1.075
2%	1.150
3%	1.225
4%	1.300
5%	1.375

NOTE: Unless otherwise stated, assume a traffic growth rate of 2%.

## **HIGHWAY LIGHTING ACCIDENT WARRANT ANALYSIS WORKSHEET**

**Figure 78-2B** (cont'd.)